

REMARKS

This application has been reviewed in light of the Office Action dated April 9, 2003. Claims 1-15 are pending in this application. Claims 10-15 have been added to provide Applicants with a more complete scope of protection. Claims 1-4, 10, and 13 are in independent form. Favorable reconsideration is requested.

The Office Action rejected Claims 1-9 under 35 U.S.C. § 102(b) as anticipated by U.S. Patent 5,760,538 (*Mitsutake et al.*). Applicants respectfully traverse this rejection.

Applicants submit that independent Claims 1-4, together with the remaining claims dependent thereon, are patentably distinct from *Mitsutake et al.* at least for the following reasons.

There may be two methods for applying a signal to an object (such as a terminal of wirings). A current control method (according to the present invention) applies a signal having a predetermined current to the object. A voltage control method applies a signal having a predetermined voltage to the object. Each method satisfies Ohm's law, $V=IR$.

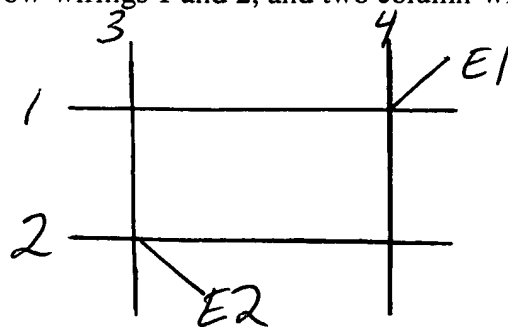
If the resistance R is variable, the driving of each feature in an apparatus exhibits a different behavior based on whether the current control or voltage control method is used. For example, in a first example, assume that the devices to be driven are connected to row-wirings and column-wirings, and a current between a row-wiring and a column-wiring is not branched to another device or wiring. In this structure, assuming a voltage driving circuit applies a voltage signal set in accordance with an input signal

provided thereof to a terminal of the column wiring, and a predetermined voltage signal is applied to a terminal of the row-wiring, the current I flowing at the terminal of the row-wiring can be represented as V/R where V is a voltage applied at the terminal of the column wiring and a voltage applied at the terminal of the row-wiring, and R is the resistance between the terminals of the row-wiring and the column-wiring.

In a second example (condition), the resistance between the terminals of the row-wiring and the column wiring is R' , which is different from the R of the first example. In this second example, since the voltage control circuit also applies a signal having the same voltage as the first example, the voltage between the terminals of the row wirings and the column-wirings is the same V as in the first example. The current, however, flowing at the terminal of the column wiring is V/R' differing from that of the first example because the resistance changes from R to R' . That is, even if the input signal is the same between the first and second examples, the currents flowing at the terminal of the column wiring between the first and second example are different from each other while the voltage will remain the same. Therefore, the currents between the first and the second examples are changed. In other words, a circuit for controlling the voltage to be applied has the above-described problem.

The inventors have determined that the resistance of each element connected to a row-wiring and a column-wiring changes as a result of a non-uniform connection of a spacer with the wiring or a non-uniform electric connection between the spacer and wiring. To further understand the difference in resistance values on the row-wiring lines resulting from these conditions, consider below a simple example of a

structure having two row-wirings 1 and 2, and two column-wiring 3 and 4, as follows:



In this arrangement, four elements to be driven are arranged at intersections. Two driving methods are considered. A first driving method drives an element E1 at the intersection of row wiring 1 and column wiring 4 by applying a signal ON to row wiring 1 and applying a signal to the column wiring 4. A second driving method drives an element E2 at the intersection of row wiring 2 and column wiring 3 by applying a signal ON to the row wiring 2 and applying a signal to the row wiring 3. If a spacer is connected only with the row wiring 1, the resistance between the row wiring 1 and column wiring 4 is different from that between the row wiring 2 and column wiring 3.

Accordingly, a voltage control method cannot handle the foregoing situation sufficiently. Applicants have discovered that the current control method of the invention, such as that defined in Claim 1, can provide the results desired.

Independent Claim 1 is directed to an electron source apparatus which has an electron source and a counter substrate arranged to face the electron source and in which the electron source has on a substrate a plurality of row-direction wiring lines, a plurality of column-direction wiring lines, and insulating layers formed at intersections between the row-direction wiring lines and the column-direction wiring lines. A plurality of electron-emitting devices are connected to the row-direction wiring lines and the column-direction

wiring lines, and a spacer maintaining an interval between the electron source and the counter substrate is arranged on some of the row-direction wiring lines among the plurality of row-direction wiring lines. The apparatus comprises a circuit for sequentially turning on the plurality of row-direction wiring lines, and a controlled current application circuit for applying a predetermined controlled current to the plurality of column-direction wiring lines.

A notable aspect of the apparatus of Claim 1 is that the spacer is arranged on some row-direction wiring lines among a plurality of row-wiring lines. Since a spacer is arranged on some wiring lines but not on others, the resistances of all of the row-wiring lines are different. In other words, the resistance values for each element connected with one of the plurality of row wirings and one of the plurality of column wirings is different based on the non-uniform connection of the spacer with the wiring or non-uniform electrical connection of the spacer with the wiring.

Mitsutake et al. relates to an electron beam apparatus and image forming apparatus. The Office Action asserts at page 4 that *Mitsutake et al.* discloses a spacer “arranged on some of the row-direction wiring lines (13) among the plurality of row-direction wiring lines (13)” and refers to column 8, line 65, to column 9, line 16, of *Mitsutake et al.* to support this assertion. Applicants note that this section discusses how the spacers 20 are arranged in parallel with the row-directed wirings 13 and how the spacers are connected to the column-directed wirings.

The Office Action, at page 2, provided general comments relating to

Voltage and Current. In response to these comments, Applicants submit that the structure of the apparatus as recited in Claim 1 includes the feature of a controlled current application circuit for applying a predetermined controlled current to the plurality of column-direction wiring lines. In other words, this feature uses a current control method, not a voltage control method, as described above.

Applicants submit that nothing in *Mitsutake et al.* would teach or suggest that feature of Claim 1, and thus Claim 1 is patentable over *Mitsutake et al.*

Independent Claims 2-4 are each similar in many respects to Claim 1, and also recite a controlled current application circuit for applying a predetermined controlled current to a plurality of column-direction wiring lines. For the reasons given above, Applicants respectfully submit that nothing in *Mitsutake et al.* would teach or suggest those features, and thus Claims 2-4 also are believed clearly patentable over *Mitsutake et al.*

Claims 10 and 13 include the feature of a conductive member that Applicants believe is not taught or suggested by *Mitsutake et al.*. Support in the specification for the conductive feature can be found at least at page 24, lines 4-17, with reference to Figure 16.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore also believed patentable over *Mitsutake et al.* for the same reasons as are those independent claims. Since each dependent claim is also deemed to define an additional aspect of the invention, individual consideration or reconsideration, as the case may be, of the patentability of each claim on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,


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